

IN THE CLAIMS:

Claims 75 through 86 were previously cancelled. Claims 1-3, 6, 8-17, 22-26, 28-35, 38-41, 43-49, and 52-72 have been amended herein. All of the pending claims 1 through 74 are presented below. This listing of claims will replace all prior versions and listings of claims in the application. Please enter these claims as amended.

Listing of Claims:

1. (Currently amended) A method for producing nonwarped semiconductor die from a wafer of a semiconductive material forming a substrate, said wafer of semiconductive material having a front side having integrated circuits formed on ~~the~~ said semiconductive material, a back side, and a front side passivation layer on a portion of said wafer of semiconductive material causing a stress, said method comprising:  
reducing a cross-section of said nonwarped semiconductor die by thinning said semiconductive material from ~~the~~ said back side of ~~the~~ said substrate for said nonwarped semiconductor die;  
applying a stress-balancing layer to said wafer of semiconductive material substantially balancing ~~the~~ said stress caused by ~~the~~ said front side passivation layer; and  
singulating said wafer of semiconductive material into a plurality of semiconductor ~~die~~ dice.
2. (Currently amended) A method in accordance with claim 1, wherein said front side passivation layer comprises a layer applied in fabrication of said nonwarped semiconductor die.
3. (Currently amended) A method in accordance with claim 1, wherein said front side passivation layer comprises a layer of passivation material.

4. (Original) A method in accordance with claim 1, wherein said thinning comprises grinding.

5. (Original) A method in accordance with claim 1, wherein said thinning comprises a chemical-mechanical method.

6. (Currently amended) A method in accordance with claim 1, wherein said nonwarped semiconductor die comprises an integrated circuit semiconductor die.

7. (Previously presented) A method in accordance with claim 1, wherein said stress-balancing layer comprises a layer substantially covering said back side.

8. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a strip covering a selected portion of a row of semiconductor dice on said wafer of semiconductive material.

9. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a plurality of portions, each ~~said portion~~ of said plurality covering a selected portion of said thinned nonwarped semiconductor die on said wafer of semiconductive material.

10. (Currently amended) A method in accordance with claim 9, wherein said selected portion comprises a majority of said thinned nonwarped semiconductor die.

11. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a film.

12. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a layer applied to said thinned nonwarped semiconductor die by one of a chemical vapor deposition (CVD) process, an evaporation process, and an epitaxy process.

13. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a layer applied to said thinned nonwarped semiconductor die by one of LPCVD, APCVD, MOCVD, PECVD, and UHVCVD.

14. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a layer applied to said thinned nonwarped semiconductor die by one of VPE, MBE, and CMOSE.

15. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a single homogeneous component.

16. (Currently amended) A method in accordance with claim 15, wherein said ~~stress-balancing~~ stress-balancing layer comprises one of a metal, alloy, metalorganic material, photoresist material, and an organic polymer.

17. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a heterogeneous composite structure comprising reinforcing particles in a solid matrix material.

18. (Previously presented) A method in accordance with claim 17, wherein said reinforcing particles comprise inorganic particles.

19. (Previously presented) A method in accordance with claim 17, wherein said reinforcing particles comprise one of a metal, an alloy, glass, and a combination thereof.

20. (Previously presented) A method in accordance with claim 17, wherein said reinforcing particles comprise particles for providing reinforcement in the X-Y plane of said stress-balancing layer.

21. (Previously presented) A method in accordance with claim 17, wherein said reinforcing particles comprise particles for providing reinforcement in the X, Y, and Z directions.

22. (Currently amended) A method in accordance with claim 17, wherein said solid matrix material comprises one of silicon dioxide, silicon nitride, and an organic polymeric material.

23. (Currently amended) A method in accordance with claim 1, wherein said nonwarped semiconductor die comprises one of a DIP, SIP, ZIP, PLCC, SOJ, SIMM, DIMM, LOC, QFP, SOP, TSOP, and a flip-chip.

24. (Currently amended) A method in accordance with claim 1, wherein said ~~stress-balancing~~ stress-balancing layer comprises a material markable with indicia.

25. (Currently amended) A method in accordance with claim 22, wherein said ~~stress-balancing~~ stress-balancing layer comprises a material markable by optical radiation energy.

26. (Currently amended) A method in accordance with claim 22, wherein said ~~stress-balancing~~ stress-balancing layer comprises a polytetrafluoroethylene tape.

27. (Original) A method in accordance with claim 25, further comprising exposing a portion of said material markable with optical energy exposing at least a portion of said material markable to one of a Nd:YAG (yttrium aluminum garnet), Nd:YLP (pulsed yttrium fiber laser) or carbon dioxide laser.

28. (Currently amended) A method for producing nonwarped semiconductor die from a wafer having a front side, a back side, and a front side layer on a portion of said wafer causing a stress, said method comprising:

reducing a cross-section of said nonwarped semiconductor die by thinning said nonwarped semiconductor die;

applying a stress-balancing layer to said wafer; and

applying a tape over said stress-balancing layer, said tape comprising a UV-penetrable polyvinyl chloride tape having an acrylic UV-sensitive adhesive disposed thereon;

exposing a portion of said tape with optical energy exposing at least a portion of said tape to one of a Nd:YAG, Nd-YLP or carbon dioxide laser; and

singulating said wafer into a plurality of semiconductor ~~die~~ dice.

29. (Currently amended) A method in accordance with ~~claim 1,~~ claim 28, wherein said ~~stress-balancing~~ stress-balancing layer comprises a first sublayer having high rigidity in the X-direction and a second sub-layer having high rigidity in the Y-direction.

30. (Currently amended) A method in accordance with ~~claim 1,~~ claim 28, wherein said stress-balancing layer comprises a layer having a coefficient of thermal expansion substantially similar to a coefficient of thermal expansion of said front side layer.

31. (Currently amended) A method in accordance with ~~claim 1,~~ claim 28, further comprising applying a die-attach adhesive to at least a portion of a surface of said ~~stress-balancing~~ stress-balancing layer.

32. (Currently amended) A method in accordance with ~~claim 1~~, claim 28, further comprising applying a temporary reinforcement layer over at least a portion of said front side layer prior to thinning said back side.

33. (Currently amended) A method for producing a small Z-dimension nonwarped semiconductor die from a semiconductor wafer of a semiconductive material forming a substrate, said semiconductor wafer of said semiconductive material having a front side having integrated circuits formed on ~~the~~ said semiconductive material, a back side, and a stress applied thereto by a front side passivation layer, said method comprising:  
reducing a cross-section of said small Z-dimension nonwarped semiconductor die by thinning semiconductive material from said back side thereof;  
applying a rigid stress-balancing layer to a portion of said thinned back side for substantially balancing ~~the~~ said stress of ~~the~~ said front side passivation layer; and  
singulating said semiconductor wafer into a plurality of nonwarped semiconductor dice.

34. (Currently amended) A method in accordance with claim 33, wherein said front side passivation layer comprises a layer applied in a microcircuit fabrication step.

35. (Currently amended) A method in accordance with claim 33, wherein said front side passivation layer comprises a layer of passivation material.

36. (Original) A method in accordance with claim 33, wherein said thinning comprises grinding by a grinding apparatus.

37. (Original) A method in accordance with claim 33, wherein said thinning comprises a chemical-physical method.

38. (Currently amended) A method in accordance with claim 33, wherein said small Z-dimension nonwarped semiconductor die comprises an integrated circuit semiconductor die.

39. (Currently amended) A method in accordance with claim 33, wherein said rigid stress-balancing layer comprises a layer substantially covering said thinned back side.

40. (Currently amended) A method in accordance with claim 33, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a strip covering a selected portion of a row of semiconductor dice on said semiconductor wafer.

41. (Currently amended) A method in accordance with claim 33, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a plurality of discrete portions, each of said ~~portion~~ plurality of discrete portions covering a selected portion of ~~the~~ said thinned back side of a die on said semiconductor wafer.

42. (Previously presented) A method in accordance with claim 41, wherein said selected portion comprises a majority of said thinned die back side.

43. (Currently amended) A method in accordance with claim 33, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a film.

44. (Currently amended) A method in accordance with claim 33, wherein said rigid stress-balancing layer comprises a layer applied to said thinned back side by one of a chemical vapor deposition (CVD) process, an evaporation process, and an epitaxy process.

45. (Currently amended) A method in accordance with claim 33, wherein said rigid stress-balancing layer comprises a layer applied to said thinned back side by one of LPCVD, APCVD, MOCVD, PECVD, and UHVCVD.

46. (Currently amended) A method in accordance with claim 33, wherein said rigid stress-balancing layer comprises a layer applied to said thinned back side by one of VPE, MBE, and CMOSE.

47. (Currently amended) A method in accordance with claim 33, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a single homogeneous component.

48. (Currently amended) A method in accordance with claim 47, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises one of a metal, alloy, metalorganic material, photoresist material, and an organic polymer.

49. (Currently amended) A method in accordance with claim 33, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a heterogeneous composite structure comprising reinforcing particles in a solid matrix material.

50. (Previously presented) A method in accordance with claim 49, wherein said reinforcing particles comprise particles of inorganic material.

51. (Previously presented) A method in accordance with claim 49, wherein said reinforcing particles comprise one of a metal, an alloy, and glass.

52. (Currently amended) A method in accordance with claim 49, wherein said reinforcing particles comprise particles for providing reinforcement in the X-Y plane of said rigid stress-balancing layer.



53. (Currently amended) A method in accordance with claim 49, wherein said reinforcing particles comprise ~~partiele~~ particles for providing reinforcement in the X, Y, and Z directions.

54. (Currently amended) A method in accordance with claim 49, wherein said solid matrix material comprises one of silicon dioxide, silicon nitride, and an organic polymeric material.

55. (Currently amended) A method in accordance with claim 33, wherein said small Z-dimension nonwarped semiconductor die comprises one of a DIP, SIP, ZIP, PLCC, SOJ, SIMM, DIMM, LOC, QFP, SOP, TSOP, and a flip-chip.

56. (Currently amended) A method in accordance with claim 33, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a material markable with indicia.

57. (Currently amended) A method in accordance with claim 56, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a material markable by optical radiation energy.

58. (Currently amended) A method in accordance with claim 56, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a polytetrafluoroethylene tape.

59. (Currently amended) A method for producing a small Z-dimension nonwarped semiconductor die from a semiconductor wafer having a front side, a back side, and a stress applied thereto by a front side layer, said method comprising:  
reducing a cross-section of said small Z-dimension nonwarped semiconductor die by thinning said back side thereof;  
applying a rigid stress-balancing layer to a portion of said thinned back side, ~~said stress-balancing~~ rigid stress-balancing layer comprising a material markable with indicia;  
exposing a portion of said material markable with optical energy exposing at least a portion of said material markable to one of a Nd:YAG (yttrium aluminum garnet), Nd:YLP (pulsed yttrium fiber laser) or carbon dioxide laser; and  
singulating said semiconductor wafer into a plurality of nonwarped semiconductor dice.

60. (Currently amended) A method for producing a small Z-dimension nonwarped semiconductor die from a semiconductor wafer having a front side, a back side, and a stress applied thereto by a front side layer, said method comprising:  
reducing a cross-section of said small Z-dimension nonwarped semiconductor die by thinning said back side thereof;  
applying a rigid stress-balancing layer to a portion of said thinned back side;  
applying a tape over said rigid stress-balancing layer, said tape comprising a ~~UV-penetrable~~ UV-penetrable polyvinyl chloride tape having an acrylic UV-sensitive adhesive disposed thereon;  
exposing a portion of said tape with optical energy exposing at least a portion of said tape to one of a Nd:YAG, Nd-YLP, or carbon dioxide laser; and  
singulating said semiconductor wafer into a plurality of nonwarped semiconductor dice.

61. (Currently amended) A method in accordance with ~~claim 33,~~ claim 60, wherein ~~said stress-balancing~~ rigid stress-balancing layer comprises a first sublayer having high rigidity in the X-direction, and a second sublayer having high rigidity in the Y-direction.

62. (Currently amended) A method in accordance with ~~claim 33,~~ claim 60, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a layer having a coefficient of thermal expansion substantially similar to that of said front side layer.

63. (Currently amended) A method in accordance with ~~claim 33,~~ claim 60, further comprising applying a die-attach adhesive to at least a portion of an outer surface of said rigid stress-balancing layer.

64. (Currently amended) A method in accordance with ~~claim 33,~~ claim 60, further comprising applying a temporary reinforcement layer over said front side layer prior to thinning said back side.

65. (Currently amended) A method for producing low Z-dimension nonwarped semiconductor dice having a die front side, a die back side, and a stress applied thereto by a die front side passivation layer, said method comprising:  
forming a semiconductor wafer of a semiconductive material, said semiconductor wafer of said semiconductive material having a front side, a back side, a plurality of microcircuits on said front side of ~~the~~ said semiconductive material of ~~the~~ said semiconductor wafer, and ~~a~~ said die front side passivation layer applying stress to said semiconductor wafer;  
reducing a cross-section of said semiconductor wafer by thinning said back side of ~~the~~ said semiconductive material of ~~the~~ said semiconductor wafer;  
singulating said semiconductor wafer into a plurality of semiconductor dice; and  
applying a rigid stress-balancing layer to said thinned back side of ~~the~~ said semiconductive material of ~~the~~ said semiconductor wafer under conditions which apply a back side stress generally equivalent to said front side stress of ~~the~~ said die front side passivation layer upon restoration to conditions of use of said low Z-dimension nonwarped semiconductor die-use.

66. (Currently amended) A method in accordance with claim 65, wherein said die front side passivation layer comprises a layer of passivation material.

67. (Currently amended) A method in accordance with claim 65, wherein said rigid stress-balancing layer comprises a layer applied to said back side by one of a chemical vapor deposition (CVD) process, an evaporation process, and an epitaxy process.

68. (Currently amended) A method in accordance with claim 65, wherein said rigid stress-balancing layer comprises a layer applied to said back side by one of LPCVD, APCVD, MOCVD, PECVD, and UHVCVD.

69. (Currently amended) A method in accordance with claim 65, wherein said rigid stress-balancing layer comprises a layer applied to said back side by one of VPE, MBE, and CMOSE.

70. (Currently amended) A method in accordance with claim 65, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a single homogeneous component.

71. (Currently amended) A method in accordance with claim 70, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises one of a metal, alloy, metalorganic material, photoresist material, and an organic polymer.

72. (Currently amended) A method in accordance with claim 65, wherein said ~~stress-balancing~~ rigid stress-balancing layer comprises a heterogeneous composite structure comprising reinforcing particles in a solid matrix material.

73. (Previously presented) A method in accordance with claim 72, wherein said reinforcing particles comprise particles of inorganic material.

74. (Previously presented) A method in accordance with claim 72, wherein said reinforcing particles comprise one of a metal, an alloy, and glass.

75.-86. (Cancelled)